

Virginia Electric And Power Company  
Surry Power Station  
5570 Hog Island Road  
Surry, Virginia 23883

December 30, 2003

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, D. C. 20555-0001

Serial No.: 03-577A  
SPS: JSA R1  
Docket No.: 50-280  
50-281  
License No.: DPR-32  
DPR-37

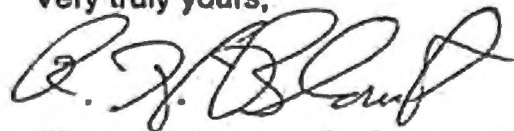
Dear Sirs:

Pursuant to 10CFR50.73, Virginia Electric and Power Company hereby submits the following Licensee Event Report supplement applicable to Surry Power Station Units 1 and 2.

Report No. 50-280, 50-281/2003-004-01

This report has been reviewed by the Station Nuclear Safety and Operating Committee and will be forwarded to the Management Safety Review Committee for its review.

Very truly yours,



Richard H. Blount, Site Vice President  
Surry Power Station

Enclosure

Commitments contained in this letter:

1. Design requirements necessary to improve the reliability of the 1G/2G Electrical distribution system will be implemented.
2. A Design Change will be implemented to clear trapped air from the cooling water piping when starting the ESW pumps during river high tidal surges.

IE22

cc: United States Nuclear Regulatory Commission  
Region II  
Sam Nunn Atlanta Federal Center  
61 Forsyth Street, SW, Suite 23 T85  
Atlanta, Georgia 30303-8931

Mr. G. J. McCoy  
NRC Senior Resident Inspector  
Surry Power Station

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)		DOCKET NUMBER (2)	PAGE (3)
SURRY POWER STATION, Unit 1		05000 - 280	1 OF 6

TITLE (4)			
Manual Reactor Trips Due To Loss of All Circulating Water Pumps			

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCUMENT NUMBER
09	18	2003	2003	-- 004 --	01	12	30	2003	Surry Unit 2	05000-281
									FACILITY NAME	DOCUMENT NUMBER
										05000-

OPERATING MODE (9) N  POWER LEVEL (10) 079 g	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)										
	20.2201(b)			20.2203(a)(3)(ii)			50.73(a)(2)(ii)(B)			50.73(a)(2)(ix)(A)	
	20.2201(d)			20.2203(a)(4)			50.73(a)(2)(iii)			50.73(a)(2)(x)	
	20.2203(a)(1)			50.36(c)(1)(i)(A)			X 50.73(a)(2)(iv)(A)			73.71(a)(4)	
	20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)			50.73(a)(2)(v)(A)			73.71(a)(5)	
	20.2203(a)(2)(ii)			50.36(c)(2)			50.73(a)(2)(v)(B)			OTHER	
	20.2203(a)(2)(iii)			50.46(a)(3)(ii)			50.73(a)(2)(v)(C)			Specify in Abstract below or in NRC Form 368A	
	20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)			50.73(a)(2)(v)(D)				
	20.2203(a)(2)(v)			X 50.73(a)(2)(i)(B)			50.73(a)(2)(vi)				
20.2203(a)(2)(vi)			50.73(a)(2)(i)(C)			50.73(a)(2)(vii)(A)					
20.2203(a)(3)(i)			50.73(a)(2)(ii)(A)			50.73(a)(2)(vii)(B)					

LICENSEE CONTACT FOR THIS LER (12)									
NAME Richard H. Blount, Site Vice President						TELEPHONE NUMBER (Include Area Code) (757) 365-2000			

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIC
C	EA	XMFR	W893	Yes						
C	BI	P	B731	Yes						

SUPPLEMENTAL REPORT EXPECTED (14)					EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).				X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On September 18, 2003, with Surry Power Station Unit 1 at 79% reactor power and Unit 2 at 100% reactor power, a manual reactor trip was initiated on Unit 1 at 1728 and on Unit 2 at 1732 due to the loss of the '1G' and '2G' buses which supply power to all eight circulating water pumps for both units. Automatic actuations occurred as expected, including Turbine Generator Trip, Anticipated Transient Without Scram (ATWS) Mitigation System Actuation Circuitry (AMSAC) Initiation, and Auxiliary Feedwater (AFW) Initiation. As a result of the loss of the circulating water (CW) pumps, the emergency service water (ESW) pumps were started. After start, 2 of the 3 ESW pump diesel engines tripped on cooling water high temperature. The ESW pumps were restarted successfully. At 1845, the 2G bus was energized, CW pumps were started and the ESW pumps were secured. Root cause evaluations determined the cause of the loss of all AC electrical power to the CW pumps and tripping of the two ESW pumps were design issues. There were no significant safety consequences or implications for this event. This event is reportable pursuant to 10CFR50.73(a)(2)(iv)(A) since the event resulted in manual actuation of the reactor protection system and the initiation of the AFW system and 10CFR50.73(a)(2)(i)(B) for operation or condition prohibited by Technical Specifications.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

**1.0 DESCRIPTION OF THE EVENT**

On September 18, 2003, Hurricane Isabel made landfall on the North Carolina coast. Hurricane force winds were not projected (nor did they occur) for the Surry Power Station site therefore, both units continued to operate prior to the manual trips discussed in this report. A Notification of Unusual Event (NOUE) was declared at 0900 hours due to the projected weather conditions associated with Hurricane Isabel.

At 1643 hours, a phase-to-phase fault occurred on the 2G-4160 VAC bus line to the Low Level Intake Structure (LLIS) causing a loss of the bus [E1IS-EB,BU]. Operators entered abnormal procedures to conserve canal inventory. The operating Unit 2 circulating water (CW) pumps were lost as a result of the de-energized 2G electrical bus. The 2G bus was re-energized at 1653 hours through the 1G/2G bus cross tie breaker (15G8) and two CW pumps were manually restarted.

At 1710 hours, Control Operations personnel observed electrical arcing on the 1G-4160 VAC distribution line at the top of the underground/above ground interface (get-a-way) pole located adjacent to the switchyard. At 1725 hours, the 1G line experienced a phase to ground fault causing a loss of the 1G bus. The loss resulted in a complete loss of AC electrical power to the LLIS and a loss of all CW pumps. A six-hour clock to hot shutdown was entered in accordance with Technical Specification 3.01.

The Shift Manager determined that restoration of LLIS power would not be immediate and directed both units to be tripped, starting with Unit 1. On September 18, 2003, with Unit 1 at 79% reactor power, a manual reactor trip was initiated at 1728 hours. All control rods [E1IS-AA] fully inserted and the shutdown margin for Unit 1 was determined to be satisfactory. Automatic actuations occurred as expected, including the Turbine Generator Trip, ATWS AMSAC initiation, and Auxiliary Feedwater [E1IS-BA] initiation. With Unit 2 at 100% reactor power, a manual reactor trip was initiated at 1732 hours. On Unit 2, eight control rod position indicators (IRPIs) showed greater than 10 steps but less than 20 steps following the reactor trip. Emergency boration was initiated and the shutdown margin was verified to be satisfactory. The IRPIs drifted to less than 10 steps within 32 minutes of the reactor trip. Transfer of station service loads to the reserve station service transformers occurred as designed. When Unit 2 station service buses transferred to reserve station service, load shed occurred on both units as designed. The operating staff stabilized both units at hot shutdown.

Auxiliary Feedwater automatically initiated as designed for both units on low low steam generator level following the trip. Primary reactor coolant system (RCS) temperature decreased to approximately 543 and 538 degrees Fahrenheit (F) on Unit 1 and 2 respectively, and both units were stabilized at 547 degrees F.

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No primary safety or relief valves [EIS-AB-RV] were actuated during the event on either unit. As a result of the loss of the CW pumps, three emergency service water (ESW) pumps [EIS-BI-P] were started. At 1815 hours it was identified that ESW pumps 1-SW-P-1A and 1C tripped due to diesel engine jacket cooling water high temperature. The pumps were checked and restarted successfully.

Control Operations personnel were able to reset the trip relays for the 2G electrical line and at 1845 hours, AC electrical power was restored to the LLIS. The 1G electrical bus was energized through the cross-tie breaker from the 2G electrical bus. Two CW pumps were restarted and the ESW pumps were secured.

Due to the Reactor Protection System and ESF Equipment actuations, a four-hour and eight-hour non-emergency report to the NRC was made at 2101 hours in accordance with 10CFR50.72(b)(2)(iv)(B) and 10CFR50.72(b)(3)(iv)(A).

At 2119 hours, with both units at hot shutdown, the 2G power supply was lost a second time. The loss resulted in a loss of AC electrical power to the LLIS and a loss of all CW pumps. All ESW pumps were again started and operated normally. The 2G line was re-energized at 2316 hours and the 1G electrical bus was energized from the 2G electrical bus through the cross-tie breaker. Two CW pumps were restarted and the ESW pumps were secured. This report is being submitted pursuant to 10 CFR 50.73 (a)(2)(iv)(A) as an event that resulted in the automatic actuation of engineered safety features and the reactor protection system and 10CFR50.73(a)(2)(i)(B) for operation or condition prohibited by Technical Specifications.

## 2.0 SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS

This event resulted in no significant safety consequences or implications. The Unit 1 and 2 manual reactor trips were initiated to conserve canal inventory as a result of the loss of power to all CW Pumps. Intake canal level was approximately 27.5 feet when the trips were initiated. With the pumps de-energized and no efforts made to conserve canal inventory, the intake canal level would have decreased until the low level canal turbine trip actuated at 23.5 feet. Automatic actuations occurred for both trips as expected, including Turbine Generator Trip, Auxiliary Feedwater initiation and ATWS AMSAC initiation. Load Shed was initiated as designed following the Unit 2 electrical power transfer. Primary RCS temperature decreased to approximately 543 and 538 degrees F on Unit 1 and 2 respectively and was stabilized at 547 degrees F.

No primary safety or power operated relief valves actuated during the event on either unit. As a result of the loss of the CW pumps, three ESW pumps were started to conserve intake canal level. After start, 2 of the 3 ESW pumps tripped on diesel engine cooling water high temperature. The pumps were restarted successfully. A risk assessment

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

determined that the integrated risk for this event was of very low significance. No indication of primary to secondary leakage existed on either unit; therefore no adverse radiological consequences resulted from this event and the health and safety of the public were not affected.

### 3.0 CAUSE

A Root Cause Evaluation was initiated to determine the root cause of the losses of the 1G-4160 VAC and 2G-4160 VAC busses. The cause of the initial loss of the 2G-4160 VAC bus was wind blown debris landing across the conductors creating a phase to phase short at the 2G LLIS overhead/underground transition (get-a-way) pole.

The loss of the 1G bus was determined to be a phase to ground fault between the B phase conductor and the switchyard get-a-way pole. The 1G B phase conductor contacted the get-a-way pole and a phase to ground fault caused a loss of the 1G bus.

The second loss of the 2G bus was determined to be due to wind blown debris landing on the C phase bushing on the 2G transformer. The Raychem animal guard was blown from the transformer bushing by wind allowing exposure of the bushing. The 2G bus was re-energized at 2316 hours and the 1G electrical bus was energized from the 2G electrical bus through the cross-tie breaker.

The root cause evaluation concluded that the cause for the losses of electrical power to the LLIS distribution system was inadequate design. The initial configuration of the 1G/2G lines was underground burial from the switchyard to the LLIS, however, due to cable failures, the lines were installed overhead around 1983. The overhead lines were not designed to withstand the environmental conditions that were experienced.

A RCE was also initiated to determine the root cause of the ESW pump trips due to diesel engine cooling water high temperature. The cause of the ESW pump trips was the inability to clear the air from the cooling water piping when the pumps were operating at low engine speed. The high river water level due to the storm surge elevated the backpressure on the cooling discharge line which hindered the air from being discharged from the piping when the pumps were running at a low speed. When the ESW pumps were again started and engine speed was raised to normal operating speed, the three pumps operated satisfactorily. Further analysis from the RCE concluded the cause of the ESW pump trips was due to design deficiency. High river tidal surges provide an increased discharge static head such that sufficient pump discharge head is not available to overcome the static head of water and sweep out the trapped air column. With air trapped in the piping, a prime cannot be established in the cooling water loop, resulting in no cooling water flow or a significantly reduced flow.

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**4.0 IMMEDIATE CORRECTIVE ACTION(S)**

Control room operators entered abnormal procedures and tripped the units to conserve canal inventory.

Following the reactor trip, control room operators acted promptly to place the units in a safe, shutdown condition in accordance with emergency and other operating procedures.

The Shift Technical Advisor monitored the critical safety function status trees to ensure that plant parameters remained acceptable.

**5.0 ADDITIONAL CORRECTIVE ACTIONS**

Root Cause Evaluation teams were assigned to investigate and address actions to preclude recurrence.

Operating procedures and operations periodic tests have been revised to start ESW pumps at full throttle and require the operator to monitor engine operation until coolant temperature has stabilized. Also, appropriate operating procedures and operating checklists have been modified to start all three ESW pumps when the projected tide at the LLIS is greater than 8.0 feet above mean sea level.

**6.0 ACTIONS TO PREVENT RECURRENCE**

Design requirements necessary to improve the reliability of the 1G/2G Electrical distribution system will be implemented.

A Design Change will be implemented to clear trapped air from the cooling water piping when starting the ESW pumps during river high tidal surges.

**7.0 SIMILAR EVENTS**

Surry has experienced one event involving the loss of the 1G-4160 VAC buss due to debris. Phase to ground contact on a distribution pole made from a tree branch resulted in a pole top fire. The damaged wooden crossarm was replaced with a new fiberglass/composite crossarm. There were no similar events associated with ESW pump trips due to diesel engine high cooling temperature during operation.

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**8.0 MANUFACTURER/MODEL NUMBER**

Westinghouse Electric Corp. / TYPE SL

Sulzer Bingham Pumps, Inc. / VLTM-1D471

**9.0 ADDITIONAL INFORMATION**

Unit 1 was returned to service on September 21, 2003.

Unit 2 remained shutdown due to a planned refueling outage.